Case Report

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Blindsided by the Monospot test

Abstract: A 20-year-old man developed bilateral forearm paresthesias after propping his elbows on the desk. He was diagnosed with ulnar neuropraxia and instructed to follow up with a neurologist. The symptoms continued and the patient was admitted for a formal workup of his neuritis. A Monospot test was positive. The patient was discharged with a diagnosis of infectious mononucleosis. A comment on his complete blood count, showing absolute lymphocytosis with atypical lymphocytes and rare blasts with flow cytometry recommended, was missed, possibly due to the fact that it was not highlighted red on the electronic medical record indicating an abnormal result. A month later, an outpatient diagnosis of B-lymphoblastic leukemia/lymphoma was made on flow cytometry. This case highlights cognitive errors in diagnosis, including premature closure and failing to ‘see’ key data, as well as vulnerabilities created by data display limitations of the electronic medical record.

Keywords: clinical reasoning; diagnostic error; electronic health record; electronic medical record; lymphoma; Monospot; patient safety; premature closure.

Background

Clinical diagnostic reasoning can be degraded by a wide range of cognitive errors. One of the most common is a tendency to premature closure, accepting the first reasonable diagnosis that explains all the facts at hand, without considering plausible alternatives. We present a case that illustrates this tendency. Coupled with a vulnerability associated with data display in the electronic medical record, this led to an incorrect diagnosis of mononucleosis, and delayed diagnosis of a treatable malignancy.

Case presentation

A 20-year-old man developed bilateral forearm paresthesias after propping his elbows on the desk. Physical exam revealed tingling in the fingers with percussion of the ulnar nerves, but was otherwise unremarkable and showed no focal neurological deficits. The patient was diagnosed with ulnar neuropraxia and instructed to follow up with a neurologist. Outpatient workup was notable for a white blood count of 14,800/mm³ with few atypical lymphocytes, a C-reactive protein 2.903 mg/dL (normal <0.748), and an erythrocyte sedimentation rate of 42 mm/h (normal <23).

The symptoms continued and the patient was admitted for a formal workup of his neuritis. Diagnostic tests included a nuclear magnetic resonance scan of the brain, computed tomographic visualization of the cervical spine, and lumbar puncture, all of which were unremarkable. A Monospot test, prompted by the presence of the atypical lymphocytes, was positive. The patient was discharged with a diagnosis of neuritis due to infectious mononucleosis.

A comment on the patient’s leukocytes, noting both atypical lymphocytes and rare blasts, along with a recommendation for flow cytometry, was missed by the ordering clinician. Possibly contributing to this oversight, this information was not highlighted red as being abnormal, the hospital’s standard procedure for communicating abnormal results. One month later, a diagnosis of B-lymphoblastic leukemia/lymphoma was made, based on results of flow cytometry results requested at that time. Polymerase chain reaction-based test for Epstein-Barr virus DNA returned as negative in the cerebral spinal fluid, suggesting that the Monospot test was a false-positive.

Discussion

Diagnostic errors usually reflect a combination of cognitive errors in clinical reasoning and system-related...
contributions; our case report includes both. Two cognitive errors were evident in this case, the first being key clinical information relevant to the ultimate diagnosis of a treatable malignancy, was missed by the ordering clinician. The second error was that a somewhat reasonable yet ultimately incorrect diagnosis of mononucleosis was settled upon even though the presenting symptoms did not fully correlate with the disease process. This tendency has been termed “premature closure” and in a larger series of cases reviewing diagnostic errors, premature closure was the most common cognitive shortcoming identified [1]. Premature closure is encountered more frequently in patients with complex disease states and in the elderly who may have multiple of medical problems [2].

Premature closure may lead to the treatment for a condition that does not exist, or, as in our case, failing to consider the correct diagnosis in a timely manner. Our patient presented with bilateral forearm paresthesias – a symptom which is clearly not commonly associated with mononucleosis. Yet a positive Monospot test provided a convenient, though unsatisfactory diagnosis which delayed treatment for lymphoma, a disease in which early treatment is directly related to a positive outcome.

In view of the morbidity and mortality possibilities caused directly by premature closure, the obvious question arises of how to avoid this type of cognitive mistake. Using normative approaches to decision making has been proposed as one way of reducing the frequency of this error [3]. Other strategies involve reviewing the same case at a later time, in a refreshed state, or asking questions such as “What else could this be?” and “What diagnosis can I not afford to miss?” Constructing a differential diagnosis in every case may be helpful while simply being aware that premature closure exists may also help prevent it [4, 5].

The system-related contribution to error in this case involved data presentation in the electronic medical record. Generally, normal test results are shown in a blue font, and results outside the normal range are shown in red. There are however exceptions to this rule as seen in the presented case. When a laboratory result is not a quantitative one but rather, a qualitative one, such as abnormal cell morphology, the lab results are transmitted in the font color of blue and require the user to double click on the result itself and another window will appear containing the qualitative data. This data then requires application of medical knowledge in order to determine if there is an irregularity. In the presented case, the WBC morphology results were presented in a blue colored font which did not prompt the initial evaluator to investigate the laboratory data further.

A common assumption is that errors are most likely to occur in the analytical phase, the component of laboratory testing considered the most complex. Post-analytical laboratory processes have been considered to be less prone to error because of the widespread adoption of laboratory automation and interfaced laboratory reporting. Recently however, it been demonstrated that even with new technologic facilities, post-analytical errors can occur [6] and in fact are more common than analytical phase errors [7]. The importance of how clinical data is displayed in the electronic medical record has recently been emphasized as a feature that is highly relevant to diagnostic performance [8].

Conclusions

Medical diagnosis is complex and requires the clinician to synthesize information from the patient and the patient’s medical record. Our case illustrates both cognitive and system-related vulnerabilities in this process. The delayed diagnosis of this patient’s malignancy reflected the normal predisposition of clinicians to quickly identify a likely diagnosis, and how errors can occur at the interface between clinician and the electronic medical record.

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References